TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC7WB383FK

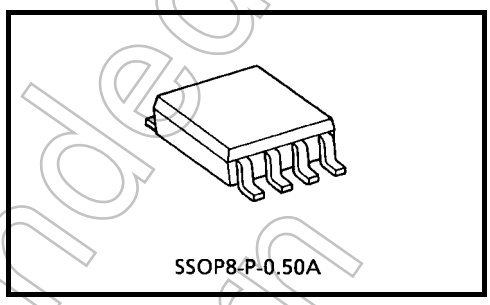
2-Bit Bus Exchange Switch

The TC7WB383FK is a low on-resistance, high-speed CMOS 2-bit bus exchange switch. This bus switch allows the connections or disconnections to be made with minimal propagation delay while maintaining Low power dissipation which is the feature of CMOS.

When output enable ($\overline{OE}$) is at high level, the switches are off. When at low level, the switches are on, and by the logic of EX terminal, it can choose whether 2 bits data are transferred to the corresponding terminal as it is, or the data are transferred to a terminal with exchanging data line. Therefore it may be used as 2 to 1 multiplexer switch.

Since the switch channels consist of N type MOSFET, the high level output voltage is provided about 1 V lower than V_{CC} level.

All inputs are equipped with protection circuits to protect the device from static discharge.

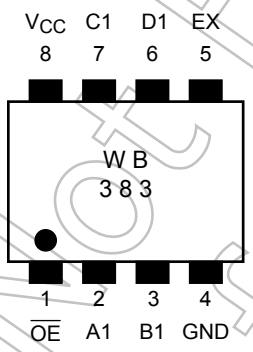


Weight: 0.01 g (typ.)

Features

- Operating voltage: V_{CC} = 4.5 to 5.5 V
- High speed operation: t_{pd} = 0.25 ns (max)
- Ultra-low on resistance: R_{ON} = 5 Ω (typ.)
- ESD performance: Machine model ≥ ±200 V
  Human body model ≥ ±2000 V
- TTL level input (control input)
- Package: US8

Pin Assignment (top view)

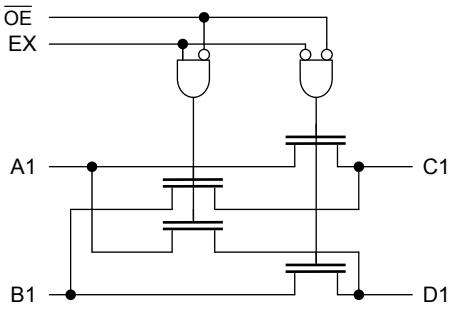


Start of commercial production
2001-06

Truth Table

$\overline{OE}$	EX	A1	B1	C1	D1	Function
H	X	Hi-Z				Disconnect
L	L	A1 = C1, B1 = D1				Connect
L	H	A1 = D1, B1 = C1				Exchange

System Diagram



Absolute Maximum Ratings (Note)

Characteristics	Symbol	Rating	Unit
Power supply voltage	V_{CC}	−0.5 to 7.0	V
Control pin input voltage	V_{IN}	−0.5 to 7.0	V
Switch terminal I/O voltage	V_S	−0.5 to 7.0	V
Clump diode current	I_{IK}	−50	mA
Switch I/O current	I_S	128	mA
Power dissipation	P_D	200	mW
DC V_{CC}/GND current	I_{CC}/I_{GND}	±100	mA
Storage temperature	T_{stg}	−65 to 150	°C

Note: Exceeding any of the absolute maximum ratings, even briefly, lead to deterioration in IC performance or even destruction.
Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook (“Handling Precautions”/“Derating Concept and Methods”) and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Operating Ranges (Note)

Characteristics	Symbol	Rating	Unit
Power supply voltage	V_{CC}	4.5 to 5.5	V
Control pin input voltage	V_{IN}	0 to 5.5	V
Switch I/O voltage	V_S	0 to 5.5	V
Operating temperature	T_{opr}	−40 to 85	°C
Control pin input rise/fall time	dt/dv	0 to 10	ns/V

Note: The operating ranges must be maintained to ensure the normal operation of the device.
Unused inputs must be tied to either V_{CC} or GND.

Electrical Characteristics

DC Characteristics (Ta = –40~85°C)

Characteristics		Symbol	Test Condition		V_{CC} (V)	Min	Typ. (Note 1)	Max	Unit
Control pin input voltage	"H" level	V_{IH}	—		4.5 to 5.5	2.0	—	—	V
	"L" level	V_{IL}	—		4.5 to 5.5	—	—	0.8	
Input leakage current		I_{IN}	V_{IN} = 0 to 5.5 V		4.5 to 5.5	—	—	±1.0	μA
Power off leakage current		I_{OFF}	A, B, $\overline{OE}$ = 0 to 5.5 V		0	—	—	±1.0	μA
Off-state leakage current (switch off)		I_{SZ}	A, B = 0 to 5.5 V, $\overline{OE}$ = V_{CC}		4.5 to 5.5	—	—	±1.0	μA
ON resistance	(Note 2)	R_{ON}	V_{IS} = 0 V	I_{IS} = 64 mA	4.5	—	5	7	Ω
				I_{IS} = 30 mA	4.5	—	5	7	
			V_{IS} = 2.4 V, I_{IS} = 15 mA		4.5	—	10	15	
Quiescent supply current		I_{CC}	V_{IN} = V_{CC} or GND I_{OUT} = 0		5.5	—	—	10	mA
		ΔI_{CC}	V_{IN} = 3.4 V (one input)		5.5	—	—	2.5	mA

Note 1: The typical values are at V_{CC} = 5 V, Ta = 25°C.

Note 2: Measured by the voltage drop between A and B pins at the indicated current through the switch. On resistance is determined by the lower of the voltages on two (A or B) pins.

AC Characteristics (Ta = –40~85°C)

Characteristics	Symbol	Test Condition	V_{CC} (V)	Min	Max	Unit
Propagation delay time (bus to bus)	t_{pLH} t_{pHL}	Figure 1, Figure 2 (Note)	4.5	—	0.25	ns
Propagation delay time (EX to bus)	t_{pLH} t_{pHL}	Figure 1, Figure 3	4.5	—	4.5	ns
Output enable time	t_{pZL} t_{pZH}	Figure 1, Figure 4	4.5	—	4.5	ns
Output disable time	t_{pLZ} t_{pHZ}	Figure 1, Figure 4	4.5	—	5.5	ns

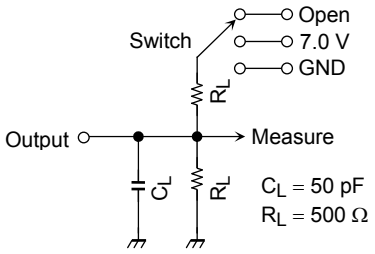
Note: This parameter is guaranteed by design but is not tested. The bus switch contributes no propagation delay other than the RC delay of the typical on resistance of the switch and the 50 pF load capacitance, when driven by an ideal voltage the source (zero output impedance).

Capacitive Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	V_{CC} (V)	Typ.	Unit
Control pin input capacitance	C_{IN}	(Note)	5.0	3	pF
Switch terminal capacitance	$C_{I/O}$	$\overline{OE}$ = V_{CC} (Note)	5.0	17	pF

Note: This item is guaranteed by design.

AC Test Circuit



Parameter	Switch
t_{pLH}, t_{pHL}	Open
t_{pLZ}, t_{pZL}	7.0 V
t_{pHZ}, t_{pZH}	Open

Figure 1

AC Waveform

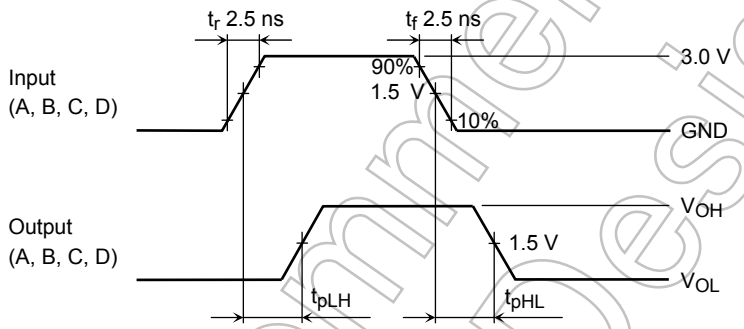


Figure 2 t_{pLH}, t_{pHL}

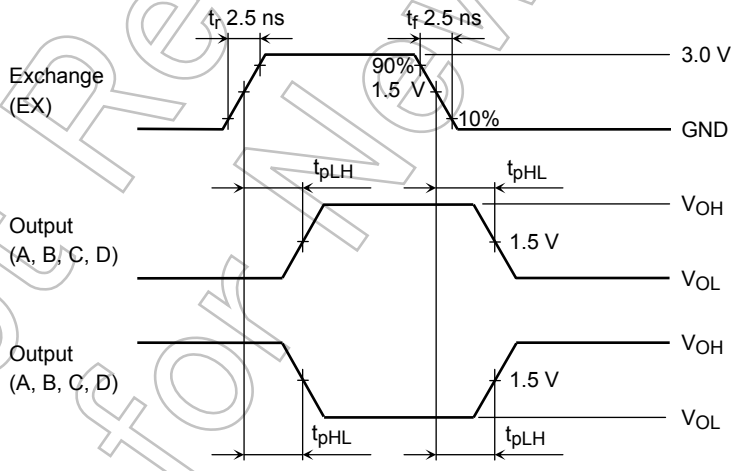


Figure 3 t_{pLH}, t_{pHL}

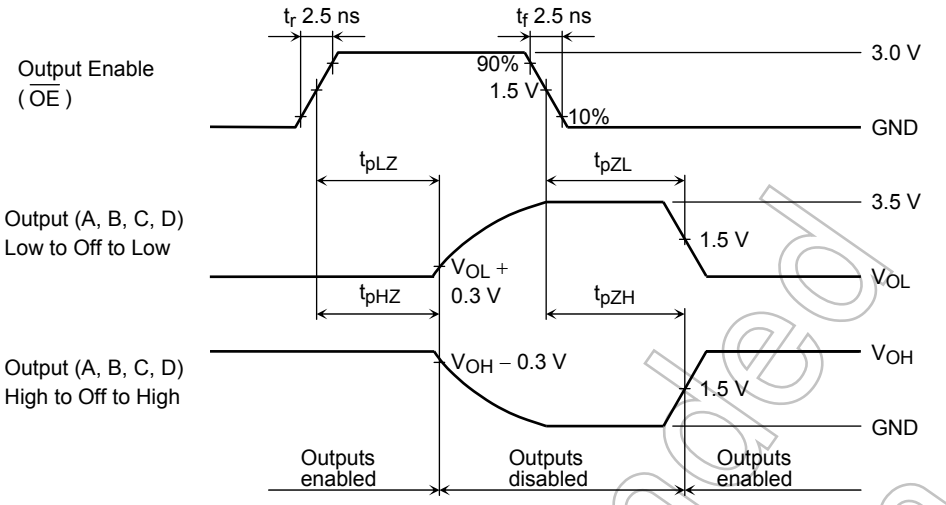
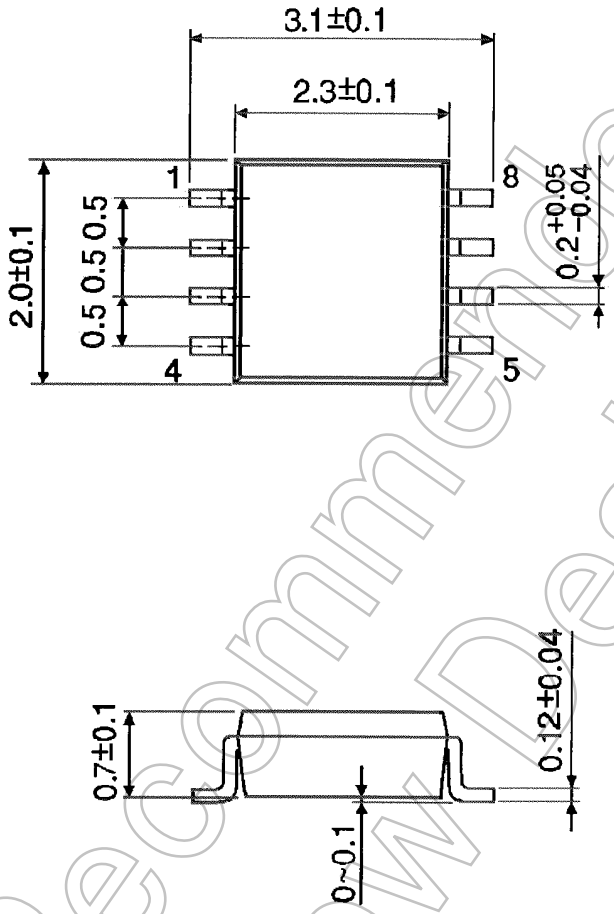


Figure 4 t_{pLZ}, t_{pHZ}, t_{pZL}, t_{pZH}

Package Dimensions

SSOP8-P-0.50A Unit : mm



Weight: 0.01 g (typ.)

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